PREVALENCE OF VIA ANTIBODIES IN CATTLE FROM THE SAVANNAS OF THE DEPARTMENT OF META, COLOMBIA

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SUMMARY

The finding of foot-and-mouth disease virus (FMDV) in healthy carrier cattle is an important means to studying the epidemiology of the disease in a specific region. The detection of these FMDV carriers provides a better understanding of virus activity at a population level.

The purpose of this study was to determine and quantify the presence of VIAA reactors in the stable cattle population on the Savannas of the Department of Meta, to define their geographic distribution, to perform a blood sampling of cattle unloaded in Puerto López, and to conduct an opinion survey about the presence or absence of vesicular diseases in the referred region. The VIA antigen used was obtained by viral precipitation with polyethilene-glycol and treatment of the supernatant with ammonium sulphate. The test performed was the Ouchterlony gel double immunodiffusion technique. Cattle sera were collected from animals located on farms selected according to a multistage surface sampling pattern.

Among a total of 1054 serum samples, 361 (34 percent) were drawn from cattle under two years of age, and 693 (66 percent) came from cattle older than 2 years. Of the total of 220 cattle (20.9 percent) reacting positively to the VIA antigen, 32 (8.9 percent) were younger than 2 years and 188 (27.1 percent) older than 2 years. The difference between the two percentages of reactors was highly significant ($p < 0.01$). Serological samples from cattle unloaded in Puerto López involved 288 males and 108 females, with positive reactors of 31.9 and 43.5 percent, respectively. These results indicated a relatively high activity of FMDV in the region studied.

Further studies to detect cattle carriers of FMDV by the collection of oesophagus-pharyngeal fluid from cattle by means of isolation of FMDV during at least one year, are recommended.

INTRODUCTION

Awareness of the existence of foot-and-mouth disease virus (FMDV) carrier cattle is of special importance in the campaign against the disease, because a number of such carrier cattle can harbor the virus for varying periods of time after having had a manifest or subclinical infection, the situation can become the source of an outbreak as the carriers infect susceptible animals or develop the disease themselves. In the carrier state, the animals jeopardize the health status of the region and the effectiveness of the prevention and control measures *(12)*.

Cowan and Graves in 1966 *(2)* reported the discovery of the virus-infection-associated-antigen (VIAA), which stimulates the production of antibodies and has been related to the virus replicative

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activity in infected cells, without the animal necessarily manifesting the disease.

To detect the presence of specific antibodies against the VIA antigen, McVicar and Sutmöller *(6)* reported on the utilization of the agar gel immunodiffusion technique in accordance with the methodology described by Cowan and Graves. Urbina *et al. (11)* found that the double immunodiffusion test, using VIA antigen, provided high sensitivity and high specificity in the detection of reactor cattle.

The results reported by McVicar and Sutmöller were confirmed in Colombia by Lobo *et al. (4, 5)*, who used the double immunodiffusion technique with crude VIA antigen obtained by simple precipitation with ammonium sulphate. The findings of a series of serological surveys conducted in South America began to appear in 1976. Studies carried out by Rosenberg *et al. (10)* in the Paraguayan Chaco, on a cattle population of approximately one million, showed that 18 months after the end of an extensive epidemic outbreak, 26 percent of the cattle in the area studied yielded anti-VIAA antibodies.

A correct interpretation of these surveys recommended keeping in mind the age distribution of the cattle population under study, the probable persistence of antibodies deriving from previous infection and vaccination, and the directions of livestock transit.

In a 5-year study begun in 1974 in the Urabá area of the Department of Chocó, Barrera *et al. (1)* found a decline in the prevalence of VIAA reactors in cattle populations under two years of age. The investigators also found a greater prevalence of reactors among cattle older than two years; the difference ($p < 0.01$) was statistically significant. The younger age category also indicated a decline in the percentage of reactors over the same 5-year period. It was concluded that this type of study in disease-free and vaccination-less regions constitutes a practical, appreciable tool in FMD epidemiological surveillance.

The objective of this experiment was to determine and quantify the presence of VIAA reactor cattle in stable livestock populations on the savannas of the Department of Meta, determine their geographic distribution, and conduct an explanatory study in cattle unloaded in Puerto López and coming from the intendencias of Arauca and Casanare and from the Comisaría of Vichada. A retrospective survey about the presence or absence of vesicular diseases was conducted concurrently with the taking of blood samples (at Puerto López).

MATERIALS AND METHODS

VIA Antigen

The VIA antigen used was obtained by viral precipitation with 6 percent polyethilene-glycol (w/v) and treatment of the supernatant with 35 percent ammonium sulphate (w/v), in crude preparations of the virus replicated in BHK-21 cell suspension cultures *(4)*.

Immunodiffusion Techniques

The Ouchterlony double diffusion technique was used to detect the anti-VIAA antibodies *(7)* as explained and interpreted by other authors *(4, 5, 6)*.

The antigen was obtained and the immunodiffusion test conducted in the Vesicular Diseases Program of the Veterinary Medicine Research Laboratory (LIMV) of the ICA (Colombian Agro-livestock Institute).

Serological Studies

The cattle sera samples were obtained during the period from May 1984 to March 1985, and were later sent to the Vesicular Diseases Program.

Description of the Area

The Department of Meta is located in the central eastern area of Colombia. It forms part of the Orinoco Valley Region and comprises flat lands (80 percent, or 68,612 km^2) such as the foothill plains, the savannas, the middle basin of the Guayabero River, and part of the Macarena Sierra.

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The savanna region covers 43,300 sq. kms divided into two zones. One is the sierra, characterized by slightly wavy terrain, and the other is flat, characterized by its extremely poor soils and low density of human and cattle populations. Both of those zones are the current source of cattle for fattening and finishing on the foothill plains.

The municipalities of Puerto López, Puerto Gaitán, San Martín and Puerto Lleras lie in this area. The altitude varies from 150 to 400 meters a.s.l., the mean temperature is 25°C, and the annual rainfall is 1500-2000 mm. Rainfall is heaviest from April to mid July, then tapers off in August and September, before increasing again in October and November.

The estimated cattle population in the region of these savannas is 290,000 head, or less than 0.1 animal/hectare. Most of the existing cattle are of the type called "crossed zebu". The local "criollo" or native cattle hardly exceed one percent of the total. The predominant systems of cattle raising are breeding and weaning, which are done on open pastures on farms of 500 hectares or larger. This form of livestock production, predominantly extractive-extensive, determines the establishment of relations with "livestock receiving" areas that thus receive, by this means, epidemiological influences from the "giving areas."

The cattle in question reproduce by natural mating and selection. The birth rate hovers about 40 percent, reaching 46 percent on some ranches. The mortality rate fluctuates from 11 percent among calves to 1.5-2.5 percent in adults. It is estimated that a cow calves only 2 or 3 times during her useful life, and has a very short productive period of only 6 years *(9)*.

Statistical Pattern

The study population was considered as the "stable cattle" on the savannas of the Department of Meta, divided into two age categories: younger than, or older than, two years of age.

The size of the sample was determined by considering an estimated percentage (p) of cattle reacting positive to the VIA antigen (8 percent), a margin of error or degree of accuracy (E) of 20 percent of p, a level of reliability of 95 percent, applied in the following formula:

$$n = \frac{Z^2\ p.q}{E^2}$$

where: n = size of the sample; Z = 1.96 (α = 0.05); p = estimated percentage of positives; q = estimated percentage of negatives; E = margin of error or accuracy.

Selection of the Sample

The distribution of the samplings was done in stages, based on a surface sampling pattern: a simple random sampling selected 37 squares having 18.5 km-long sides. Thirty cattle were chosen in each square, divided into groups of 20 animals over two years of age and 10 animals under two (Fig. 1).

The calculated size of the sampling was 1104 cattle distributed in 37 squares. Additionally, an exploratory study was conducted in the livestock receiving yards at the port of Puerto López, involving cattle of any age inbound from the Intendencias of Arauca and Casanare and the Comisaría of Vichada. Those cattle are bound for fattening in the municipalities located in the foothills of the Department of Meta. A statistical sampling was not used for this study because neither the number of animals, nor boats, arriving at the port, was known, and also because boats can reach the port only during the rainy months.

RESULTS

Serological samples were drawn from a total of 1054 cattle, amounting to 95.5 percent of the calculated sampling (Table 1). 361 animals (34.2 percent) were under two years, 693 (65.7 percent) over that age. In the first category, 32 animals (8.9 percent) reacted positively. The reliability span ran from 5.9 percent to 11.9 percent. Among the cattle over two years of age, 188 head (27.1 percent) were positive, with a reliability span of 23.6 percent to 30.4 percent on a reliability level of 95 percent.

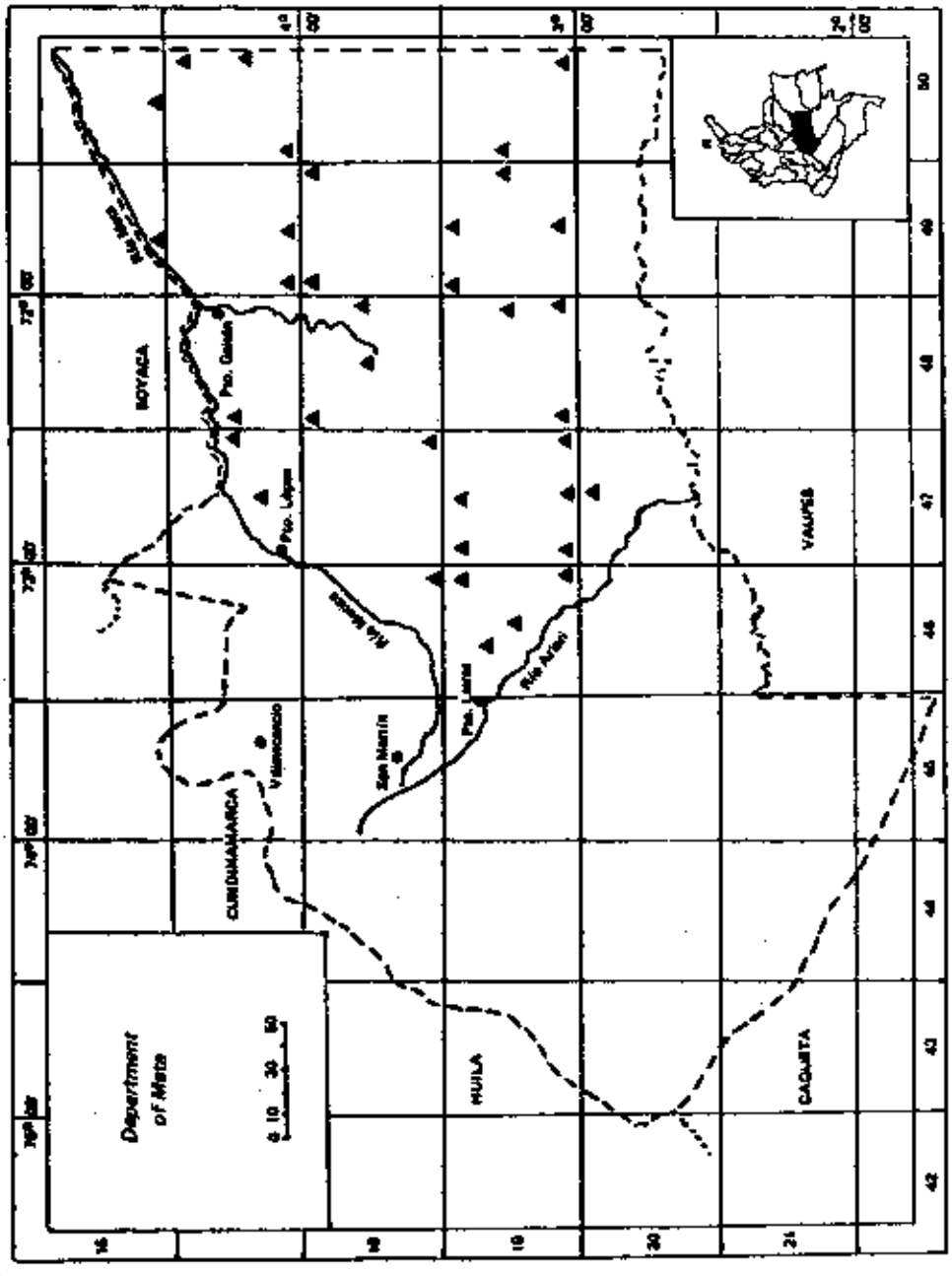
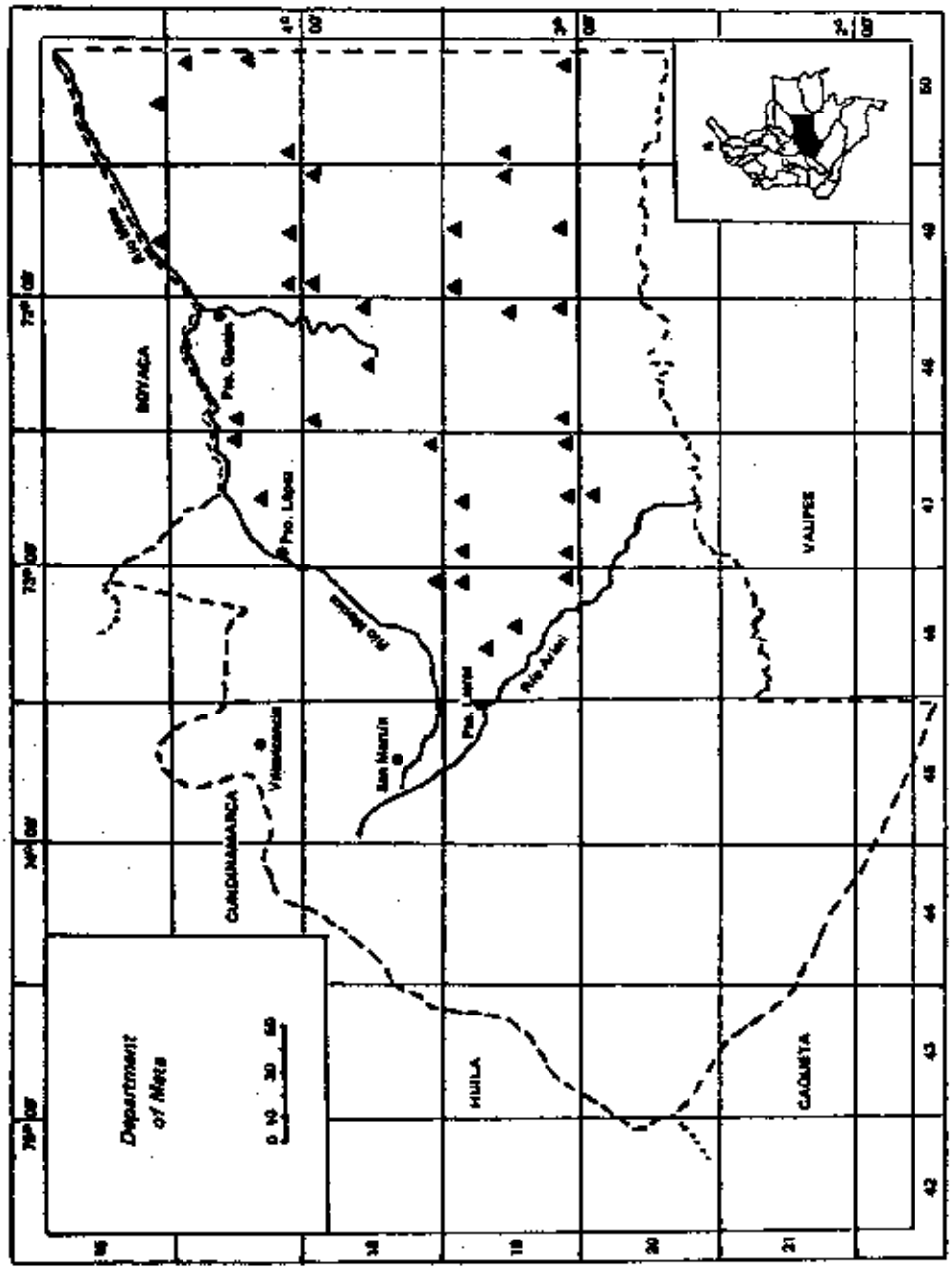


FIGURE 1. *Grid squares selected for determination of cattle reacting to VIA antigen in the savanna region of the Department of Meta. Colombia, 1985*



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The difference found between the percentages of positives for the two age categories was highly significant ($p < 0.01$).

The percentage of positive reactors to the VIA antigen was 20.9 percent of the total population. The spatial distribution of positive reactors in the study zone was homogeneous (Fig. 2).

In the retrospective opinion survey, 37 squares were interviewed. Of the 31 who replied, only 10 stated being aware of vesicular disease in the animals from the respective area. When those finding were compared to those of the serological survey, it was noted that positive reacting animals were found in 29 of the 37 squares. Likewise, in the squares where the interviewee replied "not being aware" of vesicular disease on the farm, positive reactors amounted to 18.7 percent (110/587), while the percentage of reactors was 24 percent (72/300) in squares where the disease was acknowledged. With respect to this sampling at Puerto López, blood was taken from 396 animals, of which 288 were bulls and 108 cows. Respectively, 31.9 percent and 43.5 percent reacted positively (Table 2).

TABLE 1. *Cattle reacting to VIA antigen in the Savanna of the Department of Meta. Colombia, 1985*

Age group	Positives	%	Negatives	%	Total
< 2 years	32	8.9	329	91.1	361
> 2 years	188	27.1	505	72.9	693
Total	220	20.9	834	79.1	1054

TABLE 2. *Cattle reacting to VIA antigen, unloaded at Puerto López. Colombia, 1985*

Sex	Positives	%	Negatives	%	Total
Males	92	31.9	196	68.0	288
Females	47	43,5	61	56.5	108
Total	139	35.1	257	64.9	396

DISCUSION

This study, conducted in 1984 and 1985 on the cattle population of the savannas of the Department of Meta, split that population into two age categories and applied a surface sampling grid pattern. The results of reactivity to the VIA antigen (8.9 and 27.1 percent) are indicative of virus activity, despite the low number of epithelium submissions from field episodes. The difference in the percentages obtained in the two categories may be explained by the older animals being exposed to the virus for a longer time. Some authors suggest that the small quantities of VIA antigen present in the vaccine could induce a larger number of reactors *(10)*. Estupiñán *et al. (3)* proved that this is correct. Nevertheless, this study observed that only 10 farms had records of updated vaccinations, not necessarily systematic vaccinations every four months. 21 farms reported that they vaccinated sporadically and seven reported that they never vaccinated. All this data was provided by the owners or managers of the respective farms.

The high virus activity was confirmed by the results of the study conducted on animals from the savannas in the Intendencias of Arauca and Casanare and from the Comisaría of Vichada, when they were unloaded at Puerto López, a gathering place for extraction livestock.

The reactivity results found in this study and the spatial distribution of reactor cattle are evidence of high viral activity when compared to results obtained through this same procedure in other areas considered virus-free or sporadic *(1, 8)*. The results of the opinion survey show that these farms have low vaccination coverages and frequencies. Systematic vaccination programs, which would lower the number of disease carriers, are therefore recommended.

Moreover, whereas the highland savannas compose a livestock extraction area that exerts an influence on other zones of the country, it should be given priority consideration in programs to control the spread of FMD. However, the desired coverage can be achieved only through intensive, systematic and integrated prevention and control action.

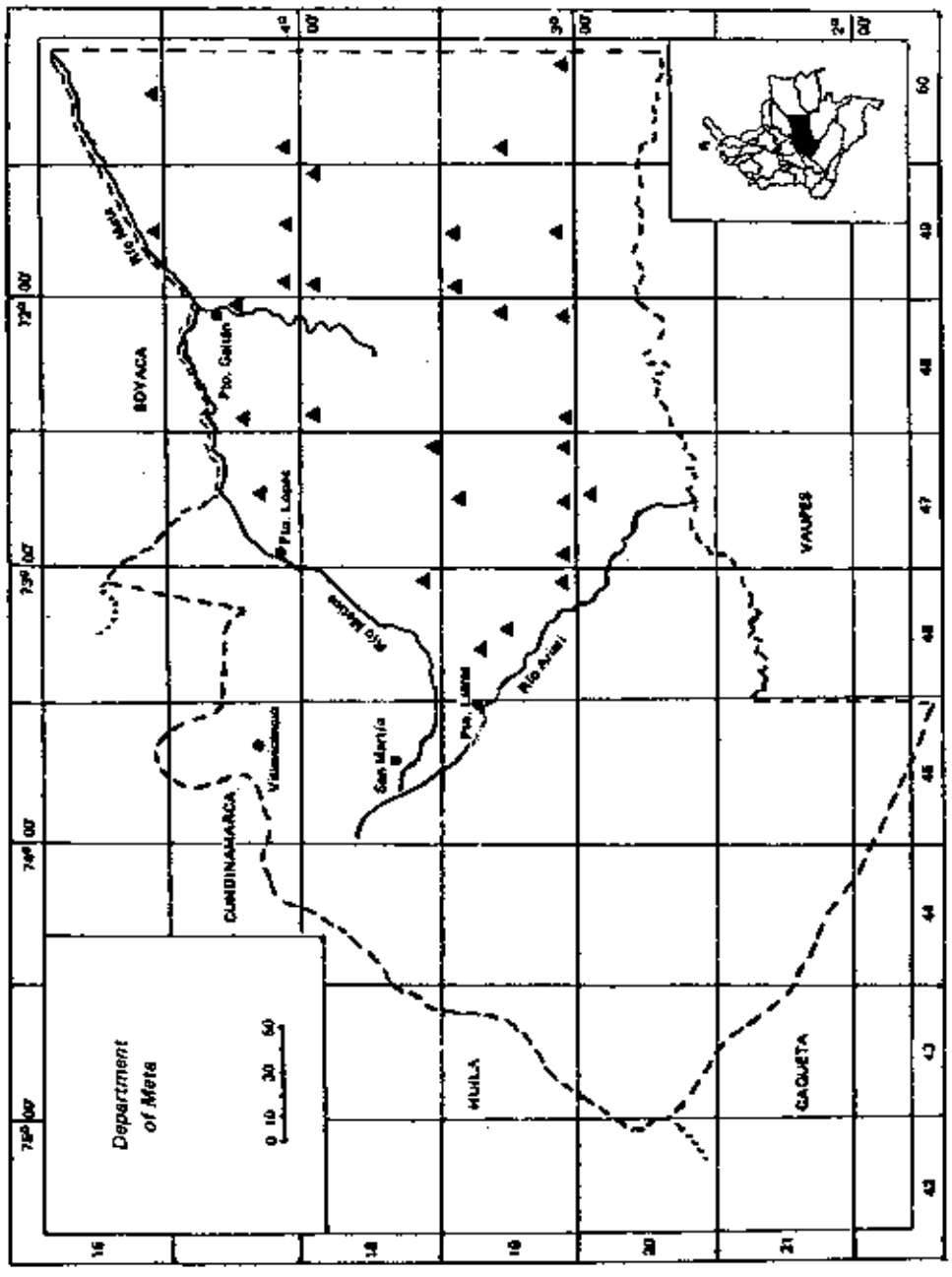

FIGURE 2. *Grid squares with cattle positive to the VIA antigen in the savanna region of the Department of Meta, Colombia, 1985*

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